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Issue 23

BCRA

The Journal of the BCRA Cave Surveying Group

COMPASS POINTS INFO

Compass Points is published quarterly in March, June, September and December. The Surveying Group is a Special Interest Group of the British Cave Research Association. Information sheets about the CSG are available. Please send an SAE or Post Office International Reply Coupon.

NOTES FOR CONTRIBUTORS

Articles can be on paper, but the preferred format is ASCII text files with paragraph breaks. If articles are particularly technical (i.e. contain lots of sums) then LaTeX or *Microsoft Word* documents (up to version 7.0) are probably best. We are able to cope with most common word processor formats. We are able to accept disks from most machines, but please check first. We can accept most common graphics formats, but vector graphic formats are much preferred to bit-mapped formats for diagrams. Photographs should be prints, or well-scanned photos supplied in any common bitmap format. It is the responsibility of contributing authors to clear copyright and acknowledgement matters for any material previously published elsewhere.

COMPASS POINTS EDITOR

Wookey, 734 Newmarket Road, CAMBRIDGE, CB5 8RS. Tel: 01223 504881
E-mail: wookey@aleph1.co.uk

SUBSCRIPTION & ENQUIRIES

Andrew Atkinson, 31 Priory Ave,Westbury-on-Trym, BRISTOL, BS9 4BZ.
Tel: 0117 962 3495
Email:andrew@atkn.demon.co.uk

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OBJECTIVES OF THE GROUP

The group aims, by means of a regular Journal, other publications and meetings, to disseminate information about, and develop new techniques for, cave surveying.

BCRA ADMINISTRATOR

20 Woodland Avenue,Westonzoyland, BRIDGWATER, Somerset, TA7 0LQ

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COMPASS POINTS LOGO

courtesy of Doug Dotson, Speleotechnologies.

INTERNET PUBLICATION

Published issues are accessible on the Web at:
http://www.chaos.org.uk/survex/cp/index.htm

THE CSG Web pages are reached viahttp://www.caves.org.uk/

Cover: Figure 1 - Disto 'laser tape' and digital clinometer attached together with tape. A level and 9V battery (on the back of the clinometer) are also attached. The tool is not very small, but quite flat so it is not difficult to transport.

CONTENTS of Compass Points 23

The journal of the BCRA Cave Surveying Group.

Editorial

Mostly an apology for the late arrival of this issue. This is due to your editor taking on too many things at once. I spent most of February editing the Cambridge University Caving Club's 1999 Journal. This (combined with the BCRA science symposium, the CUCC dinner, and a GPF meeting, as well as needed to fix my house and build a workshop/garage) has meant I've been unable to do CP until mid March. We'll try to get back on schedule for the next issue.

Largely due to the above time constraints, but also because I haven't had many articles recently, this is a relatively thin issue, but we want to get it out so that you get some warning of the Field Meet date.

It it time for the annual plea for people to write in with what you have been doing. This is your journal, so I ask any of you who have been doing anything in the surveying area to write it up. It doesn't have to be ground-breaking research - we'd just like to know who's surveying what, using which techniques. Anything you have found that work well, etc. If anyone would like to write a semi-regular column on techniques, or surveying on the web, please get in contact.

Errata

Sorry about the font I used for the URLs in issue 22. It was a misguided attempt to get them all on one line, and looked OK on the proofs, but as several of you remarked, it photocopied very badly and was largely illegible in the finished product. I'll not use that one again!

Here are the URLs again (corrected where they have changed since CP22) so that you can look them up if you like.

UTM/Lat-long conversions:
http://internetgis.com/utm/utm.html

UIS symbols:
http://www.gis.univie.ac.at/strv/strv/leute/andi/caving/cavesymbols/english.html

Survex:
http://www.survex.com/

Tunnel:
http://www.goatchurch.demon.co.uk/Tunnel/tnmain.html

CaveTools:
http://www.mindspring.com/~bszukalski/cavetools/cavetools.html

Compass:
http://members.iex.net/~lfish/compass.html

David Gibson points out that I forgot the contact details for the waterproof paper review in the last issue of Compass Points... (I should have mentionned them as they gave the prizes for free)

Weatherwriter notepads and waterproof pens are available from "VIP", Pettaugh, STOWMARKET, Suffolk, IP14 6AX. Telephone +44 1473 890285. You can order by phone and pay by credit card. Visit the web site first of all, to check the price and order code of the items you wish to order. http://www.weatherwriter.com

Forthcoming Events

Spring CSG field Meet

The date is the 10/11 April 1999 at South Wales Caving Club, Penwyllt. It has been organised by SWCC members Allan Richardson, Brian Clipstone, and Iain Miller.

The library will be available for the weekend.

We have negotiated members rates for the weekend, i.e. all CSG members attending the weekend will be charged £1.70/night if they are staying.

The organisers feel it is important to have some pre-arranged activities and aims for the weekend in order to attract people, so the following program is suggested. You are of course free to come along with other things you want to do/test/discuss.

a) The posts are still in place for the instrument tests. In the light of the data from last time we can do some slightly more rigorous testing this time round and get some definitive results.

b) There will be some form of basic surveying training, and some easy areas of OFD 1 will be identified as suitable for beginners.

c) There is the possibility of the use of a diver and Ogofphone to locate a dry chamber in the OFD 1 sump area, this would then need to be surveyed in on the surface. (This is a real project - Weather and Diver permitting). If this particular project is not possible, then it would be possible to use the Ogofphone elsewhere above OFD 1 to obtain accurate surface fixes.

Other attractions will be the opportunity to try out the current range of survey software, and to get advice on the best way to keep your datasets. A discussion on the future development direction of Survex will also be held, so come and have your say.

So, please come a long for a convivial weekend of surveying. We already have a couple of new faces expressing an interest so it should be good. There is no need to book, you can just turn up, although a phone call so we know who to expect might be a good idea.

Arthur Butcher Award

An announcement from the BCRA conference organising committee, who want to bring to your attention a slight change in the rules for how to get things considered for the award.

The Arthur Butcher Award is presented annually by BCRA at the National Caving Conference in September. Broadly speaking the award is for "excellence in cave surveying". As well as a prize, there is a trophy to be kept for a year.

To be considered for the award, individuals or caving clubs must bring their work to the attention of the judges. For a cave survey, you can do this by displaying it on your club stand at the conference. If, however, you want other work to be considered - such as a report or publication on a surveying topic, or other more general achievements - then you should contact the judges in advance. You can do this by writing to "Hidden Earth 99" at the address below.

National Caving conference - Hidden Earth 99

The conference is at Leeds this year, from 10th-12th September.

Follow the links to Hidden Earth at http://www.caves.org.uk

Offers of talks, presentations etc. to the Lecture Secretaries:

i) Paul Mann (Expo & technical),

83a Lonsdale Road, Summertown, Oxford, OX2 7ES. Tel: 01865 316387. mailto:paulmann@compuserve.com

ii) Alan Speight (UK regional),

63 High Green Road, Altofts, NORMANTON, West Yorkshire, WF6 2LG. Tel: 01924 892287

General enquiries, including Arthur Butcher Award nominations to the Bookings Manager,

Peter Cousins, 8 Giffords Croft, LICHFIELD, Staffs., WS13 7HG. Tel: (01543) 251791.

Or David Gibson at mailto:david@caves.org.uk

SNIPPETS

David Gibson, david@caves.org.uk

Apart from the waterproof pads which were reviewed in the last issue of Compass Points, VIP also sell two varieties of waterproof paper in loose sheets. One of these - Zecom - is photocopyable and laser-printable. Cave surveyors may wish to investigate the printing of their own data grids on this paper which is virtually indestructible. Even a concerted attack with a pan scourer failed to remove the printing from the paper. At 30p/sheet (packs of 100 are £26 + VAT) it is a little pricey, perhaps, but I have been very impressed with its performance as orienteering / fell-running tally cards. If anyone would like a sheet or two of this paper to try, please contact me.

LETTERS

Waterproof paper

Bob Thrun, RobertThrun@uwtech.ih.navy.mil

I got my Compass Points 22 on Feb 6. There are a couple of things I want to comment on.

The Tunnel effort sounds interesting. The URL was difficult to read, but I did find the site.

I am somewhat curious about what the WeatherWriter survey book is. Not that I ever expect to be using that brand in this country. Your little blurb has me confused because you mention Tyvek laser-printer paper. Tyvek would melt in a laser printer. We have the following kinds of materials:

- Survey books for normal land surveyors have heavy rag paper.
- "Rite-in-the-Rain" (trademark) survey books are the normal heavy rag paper that is treated with a silicone water repellent. I can make the equivalent by spraying an ordinary notebook with Scotchguard (trademark) fabric spray. One of the caving supplies dealers has this made into "Rite-in-the-Cave" books. This takes pencil when wet, but does not erase well when wet.
- Polyester drafting film (Mylar is a Dupont trademark) has a sheet of polyester film with a coating that takes pencil or ink. Ordinary pencil will wash off, but there are special plastic leads that are waterproof. India ink made for drafting film is waterproof. The film is translucent, so you can only use one side and you need to put a white sheet beneath it. This is good for drafting final maps. It might go through a copier or laser printer without melting, but I have not tried it.
- Denril (trademark) is another plastic drafting film. It appears to be a porous polyolefin. It is translucent and not as stiff as the polyester films.
- Dennison, who makes labels of all kinds, made a clear film with a white coating on both sides meant for copiers. If you made erasures on both sides you could get a clear spot. This was discontinued.
- Tyvek (Dupont trademark) is made of non-woven polyethylene fibres. I would be afraid to run it through a copier or laser printer for fear it would melt. It does not take pencil as well as paper, but it can be erased when wet, though not very well.
- Xerox Never-Tear Paper is not paper. It appears to be white (not clear) polyester (?) with a white coating on both sides. I'd make up a book of this if I knew I were going into a really wet and muddy cave. I would use the plastic pencil leads. I just stocked up on this. Two stores that had it no longer have it. I have a fear it is being discontinued after being on the market less than a year.
- One of the European cavers recommended using papers impregnated with a thin polystyrene varnish. This has to be home-made by dissolving polystyrene in acetone. I have not tried this.

Bob Thrun

Wookey replies:

Yes, the mention of Tyvek was confusion on my part, I actually meant Zecom, as David Gibson points out elsewhere (although VIP do also sell Tyvek paper). Exactly which, if any, of the above materials Zecom corresponds to is not clear.

Info on East German Compass?

Ben Cooper, ben.cooper@siemens.co.uk

Dear Editor,

In the December 98 issue of Compass Points, I was intrigued to see the article on Martin Sluka's survey compass with his additional laser pointer. I have just been given an exactly similar compass (obviously without the laser), in order to find out more about it.

The compass is chunky and heavy, being made of metal, but has a quality engineered feel to it. What is particularly unusual is that the dial is back-to-front, in that the graduations are numbered anticlockwise, with East to the left of North, rather than to the right. The dial can be rotated by a screw in the side of the unit, but there is no reference mark on the base of the unit, so there is no obvious way of zeroing the dial. There are no marks for sighting the compass either.

The compass has a number of features. A spirit level, to determine when the compass is horizontal, and an inclinometer. In addition, on the hinge of the lid is a graduation showing the angle of the lid to the base, and another spirit level, which can be viewed from both the side and the under-side. Finally, there is a 7cm ruler engraved on the edge of the lid.

It has only one marking - "Freiberger Prazisionsmechanik, Made in DDR".

I would be grateful to hear from anybody who could tell me more. In particular, why is the dial anti-clockwise, and how is the compass supposed to be used, without zero or sighting marks? Also, how is the lid to be used for measuring angles?

Thanks, Ben cooper.

Martin Sluka replies:

It is a geological compass from former East Germany (Deutch Democratic Republic = DDR),Freiberg is very famous and nice old miners town in Saxon part of Germany near Czech border. There was a factory with a long history in the production of instruments for mining geology and surveying. Unfortunately, this factory doesn't exist anymore. All the features are typical for a geological compass. We are using it without any problem, although you have to take care which colour end you read. We have used a thin line between two surveying points and we measure angles with compass parallel with line. Not very accurate, the laser pointer is better :-)

12 channel vs. 4-channel multiplex GPS

John Lyles

Abstract:: A comparison of the performance of 1st (sequential) and second (parallel) generation Garmin GPS units was undertaken in a range of conditions. The results clearly show how much better the parallel devices are, in both speed of satellite acquisition, and performance under foliage cover.

1st generation cheap consumer GPS units use sequential receivers, where the unit has only one hardware channel, which listens to each satellite for a couple of seconds at a time before moving on to the next. 2nd generation devices have several parallel hardware channels which means that they listen to all the satellites they need at once and can keep track of satellites which are not currently used. This has a dramatic effect on acquisition time and makes them much better able to get and keep a lock in difficult conditions (eg under foliage).

I used a GPS40 (8-channel sequential) and a GPS12XL (12 channel parallel) for the tests. As for the methodology, I merely set the unit on a rock or post or clear ground, turned it on, and stood far back until it presented a solution. They were not handheld readings, to prevent my body from affecting the signals. In the forest, I did have to hold it once or twice, as there was no smooth surface. So you can see that this was in no way considered a scientific study! It was consistent in that it showed the older unit was quite slow in acquiring sufficient SVs (Satellite Vehicles) to present solutions, in some places it never would lock in on enough satellites to give co-ordinates. The 12 channel seemed to always work.

Location		GPS40		GPS12XL		Foliage Coverage
		2D	3D	2D	3D	
MM 47 Saddle Rd Hawaii 4932' above sea level	Time	5:30	>7:00?	3:00	3:00	60% covered Eucalyptus
	SV	1,29,31		1,3,15,29,31		
MM 45 Saddle Road Hawaii 4423' above sea level	Time	3:00		1:15	1:15	60% covered Pine
	SV				14,15,18,29	
Holoholokai Beach Hawaii 5' above sea level	Time	2:30	5:00	0:45	0:45	no foliage
	SV	5,6,17,30		5,6,17,30		
Poleo Spring San Pedros Pk Wilderness, NM 7958' above sea level	Time	>14:00?	none	1:30	10:00	30% covered Ponderosa Pine
	SV	AUTOLOCATE - NO LOCK			4,5,7,9,24	
Poleo Spring San Pedros Pk Wilderness, NM 7958' above sea level	Time	4:00	9:00			same as above
	SV	4,5,24	4,5,7,9,24			
	FORCED GPS-40 TO LOCATE					
Los Alamos Canyon Los Alamos, NM 7119' above sea level	Time	5:00	none	1:00	1:00	90% covered Ponderosa Pine Deep canyon
	SV	4		4,5,7,9,16		
Camp May Jemez Mtn., NM 9367' above sea level	Time	>>5:00	same	3:00	3:00	95% covered Dense Spruce
	SV	NO LOCK		4,5,9,10,24		
Camp May Jemez Mtn., NM 9367' above sea level	Time	>>4:00	same	0:35	1:15	70% Aspen
	SV	NO LOCK		4,5,10,24,30		

Surveying with digital instruments

Martin Sluka

Cave surveyors have been using 'classical' instruments for 20 years. Digital equivalents are now becoming affordable and offer some advantages. MartinSluka has been doing pioneering work in this area, and describes his instruments and findings.

Historical Problems

I have been surveying caves since 1972 - quite a long time. I have used many different techniques to survey, from theodolite to "Romanian method" - topofil and simple compass without clinometer. The first surveying I participated in was theodolite surveying in a very complicated cave with many narrow passages. Hours and hours to wait for making one shot. Real surveying started with an old mining - a heavy box with large hanging compass and inclinometer. You had to stabilise the surveying points, use strong line to connect two points to hang the compass on, and use tape to measure distance.

In 1975 was my first visit to Romania, and I met for the first time cavers who did only exploration and surveying. No digging as was usual in Slovakia, where I'm originally from. Romanian cavers used a very fast method to survey - a simple orienteering compass and home-made topofils. No clinometers; the height difference was simply given as 0, 0.5, 1 m and so on. Not very accurate but fast. They drew the map directly to scale on graph paper. I visited Romanian karst more than 20 times and mapped more than 10 km of caves. In that time friends of mine discovered "waterproof graph paper" - normal graph paper impregnated with polystyrene - the best material for drawing on in caves.

In 1979 I started to use this method in my 'home cave' - Cachtice cave, to re-survey all known areas. The cave, previously surveyed with a mining hanging compass was at that time about 750 m long. After our survey it was more than 3 km long, with almost no digging. We just surveyed all small passages, faults, chimneys, pits ... Subsequently we started to use a simple clinometer, graphical reduction of distance to draw maps in caves, electronic calculator and so on. As you may imagine, the Suunto or any other standard surveying tools you use were absolutely not accessible to us at that time. To obtain simple geological compass from East Germany one had to smuggle it through border and it was really expensive too.

In 1985 we started to survey one very interesting cave in Slovakia - Cave of dead bats. It is more than 15 km long now. I have participated in several expeditions - to Slovenian Alps and to Turkey.

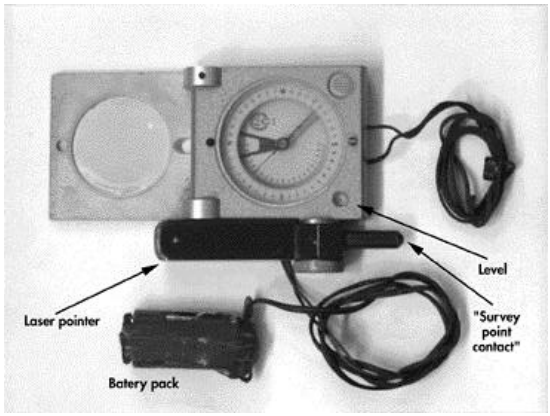

Figure 2 - 'Lasercompass' - geological compass with laser mounted on swivel attached - described in CP22

Solutions

All this time the two biggest problems were that one had to measure distance by topofil or tape, which means connecting two points by line or by tape, and the difficulties of surveying steep shots. My dream from that time was to use a laser beam for this. After quite a long break (from 1989) I started caving again three years ago. Because of the different political and economic situation I was able to realise my old dream - to make surveying tools which do not use any kind of line or tape; and also do not use any kind of optical sight, because in narrow passages, it is very often difficult to see from one point to another. The first step was the compass with attached laser pointer (Figure 2). I found it worked really very well - you may measure very accurately and there is no problem with steeply sloping, or narrow, passages. You may measure from point to point and your eyes do not have to be in line with the shot - very important.

But the problem was how to measure distance. After a couple of experiments with ultrasonic tools I found that Leica made a very nice product, the Disto Basic, a small 'laser tape', with which you may measure 100 m +/- 3 mm. So the measuring of distance was OK too.

Inclination - last problem. In a special shop for surveying tools I found a long digital level, with very good accuracy and simple calibration - the 'incliTronic'. The final task was to arrange these two instruments together with a small spirit level - to measure inclination in the vertical plane and thus ensure the incliTronic is properly aligned (Figure 1 - front cover). I have used this tool on 5 trips, with very good results. The only problem is, that human eyes in dark conditions such as in caves are very, very sensitive to the laser beam. The reflection from mud is strong enough to give a bad feeling in the eyes. So one must be careful.

I think you may survey with these tools as fast as with classical ones, but with much better accuracy and without any problem with steep shots or shots to inaccessible points. You may measure LRUD very quickly and easily, and avens, pitches, and so on.

Details

Specification of Disto Basic: range from 0.45m to 100m, accuracy +/- 0.3cm. It is 23cm long, 7.5cm wide and 4.5cm thick. It weighs 0.6kg with batteries - 4 x 1.5V AA cells. The Disto itself is waterproof with the exception of the battery compartament. You may seal it by silicone cement, but it is not necessary in 'normal cave' conditions.

Specification of incliTronic: accuracy +/-0.1deg (0.3deg), very simple calibration It is 16.5cm long, 6cm high and 2.5cm thick. It weighs 175g with batteries - one 9V PP3. It is necessary to seal the back side of the incliTronic with tape and silicone cement, because of large holes in the cover. But it is a quite simple operation. The second modification necessary is to connect two wires from the incliTronic to a standard 9V battery. Because the incliTronic has its own switch, you don't need to be particularly careful about this.

We use small aluminium plates about 5 cm in diameter as "reflecting glasses" on survey points. These are primarily to

allow the user to easily see both the target and the level on the instrument at the same time, using 'peripheral vision'.

The Disto has a timer mode - you hear five beeps and the Disto will measure distance. So you don't need to press button manually, which is good because it is quite easy to move the Disto's laser beam whilst pushing the button on longer shots. The incliTronic has four buttons: ON/OFF, Calibration, Degrees/Percents and Hold. Pressing the Hold button allows you to read the device after you have moved it and with the laser off.

The price of the Disto is about $800 (Available in the UK for £470, from ATPinstruments http://www.atp-instruments.com), and the incliTronic about $150 (about £95). Obviously this is not cheap, but is affordable for a club or expedition, and there is a big difference between surveying with 'normal' tools and with a laser.

I have tested one digital compass - WayfinderOutback, but the accuracy is quite low at +- 2 degrees and it is quite expensive too. Also battery life is very short. I think, the combination of laser pointer and compass from Topofil should be good.

Finally, my 'laser tools' are not for sale, they are much more ideas, what is possible today.

Software releases

Survex versions 0.81 and 0.90 beta released

Olly Betts and Wookey

Olly noticed a problem in the network reduction code in Survex 0.80 (but not in 0.72) which can cause the co-ordinates of a junction to change while the .3d file is being written out (so legs which should meet at the junction may not).

This is potentially serious, so the bug has been fixed and the new v0.81 released. You can download this from:

DOS: http://www.survex.com/software/svx081.zip

Source: http://www.survex.com/software/svxsrc-0.81.tar.gz

This potentially can affect anyone using 0.80, so we recommend everyone should upgrade.

Beta release v0.90

In the light of the response to the 'Proposed changes to Survex' puplishing in CP22, a new release has been made incorporating these changes to put Survex on a sounder footing for future development. The most obvious effect of this is the change of the name of the main data-processing executable from 'survex' to 'cavern' (the 'rn' coming from Network Reduction, this being a major part of what the data processing does).

Other changes are:

- Standard output during processing changed so that only lines that cause errors are displayed. This makes it much more obvious when a file was missed in the middle of a long run. The output format is also compatible with editors that understand GNU error messages. This means you can just double-click on the error line to get the offending file loaded in Emacs, for example.
- The above bug writing out the data reduction network is also present in the 0.90 alpha releases up to alpha4 - it is fixed in alpha5 onwards.
- A couple of improvements for UNIX users - Survex is now shipped as an RPM (pre-compiled binaries for i386 systems) to make installation much simpler. Xcaverot has had a bug fixed where it only loaded the first 2048 stations.

Winkarst 6.0 Released

Garry Petrie

WinKarst 6.0 is available as a self extracting zipped installation program, complete with help files and example cave surveys. After downloading the file, executing it will start the installation process. Version 6.0 has major improvements, including an integrated editor, three dimensional rose diagrams, improved export file types and support for COMPASS DAT files. Importantly, this version requires a free registration code to remove a message from the cave map displays. The registration code is obtained online after completing the registration form or by direct email from myself. WARNING, the online registration form is very slow, so please wait for a minute or two for it to complete.

The www download page is:
http://www.europa.com/~gp/winkarst.html

Thank you for your support, please email any comment or bugs.

Major improvements in WinKarst 6.0:

- Integrated cave system editor. The editor permits the users to create a systems of caves with surveys and station properties. The editor works without an intermediate file on the hard disk, all edits immediately appear. Since the edits exist in the computer's RAM, experimentation can be tested without corrupting original data on the hard disk.
- Improved file export functions. WinKarst can now export DXF to AutoCAD releases 12 and 14. The export family also includes a comma delimited UTM coordinate format, which can be imported to the shareware program, WayPoint+. The UTM export format can also be imported into TOPO!GPS series of programs.
- New file import function. WinKarst can now append data files to an already opened cave system. In addition WinKarst can now read COMPASS .DAT files. It is possible to open the base DAT file of a COMPASS make file and then import all the subsequent files in the make file to build a new composite.
- Three dimensional Rose diagrams. As in traditional Rose diagrams, which draw a radial histogram of the shot bearing distribution in the cave survey, a three dimensional drawing show the same pattern in a different format. The shot's inclination is plotted along the radial axis of the bearing, zero degrees at the circle's edge, 90 at the centre. Then each intersection of bearing and inclination is colour coded according to its frequency. The plot can simultaneously show bedding plane dip, as well as orientation.

Verified to run in Windows '95, '98 and NT. Version 6.0 will not run in Windows 3.1 and has been compiled to take advantage of Pentium class processors (no 386 or 486). WinKarst has been ported to a new compiler with new look and feel to all of its dialog boxes.

WinKarst now remembers a last read files list for easy access to the most frequently used cave surveys. The user can also save plotting preferences.

Improved accuracy. Earlier versions of WinKarst used a numerical technique called "scaled integers" which produced

graphics quickly, but created inaccuracies in DXF exports. Now WinKarst uses floating point arithmetic in all calculations and DXF exports are true. With the advent of faster Pentium processors, the performance penalty or using floating point is almost unnoticeable. As a footnote, by directly exporting a DXF view of the cave, the units (feet/metres) are preserved, enabling subsequent DXF update imports as the cave survey grows.

Registration is now required, but is still free for this version only. Future versions will time expire without purchase after a trial period. Registration codes issued for this version will be valid for future updates. The registration code is obtained from the WWW data server, or by email, gp@europa.com.

New Compass Release

Larry Fish

I would like to announce a new release of the cave survey software package COMPASS. There are many major new features and lots of minor improvements.

1. DIRECTX VIEWER FOR STUNNINGLY REALISTIC PASSAGE MODELS. There is now a special new COMPASS program for creating extremely realistic passage models. The program is called CaveX and it uses Microsoft DirectX technology. The program creates very smooth, fully three-dimensional passage models using Gourad shading and a new proprietary technique for rounding passage corners. Passages are realistically shadowed using movable light sources. The models are even shown with perspective so that far passages appear smaller. The passages can be textured with photographs of limestone giving very realistic, rock-like passages. Because of the speed and power of DirectX, the models can moved and animated in realtime. On a Pentium 90 with a fast video card, I get 40 frames per second for small caves and 10 frames per second for larger caves.

There are several images on the COMPASS web page showing the new models.

The program requires Win95/98. If you are using Win95, you must download DirectX version 6.0 from the Microsoft web site. Hardware recommendations are: Pentium class computer, 32 meg of RAM and fast video card.

2. PASSAGE MORPHOLOGY HIGHLIGHTING. The Viewer now has the ability to colour cave passages according to the size and shape of the passage. The program analyses the height, width, and cross-sectional area and can colour passages that fit into various categories. The categories include: Crawlway, Stoopway, Walking, Fissure, Canyon, Tube, Borehole and Climbs/Pits. Colouring specific passage types allows you to analyse the geology, and speologenesis. For example, you can easily see areas where there are vadose canyons or phreatic tubes. You can also pick routes through a cave that avoid crawlways, climbs or pits.

3. MERGING DEM FILES. The DEM reader can now merge adjacent DEM files.

This is useful when the area you are working with is near the edge of a DEM files. It allows you to centre your terrain models on any location.

Files can be merged east-west or north-south. A pan factor setting allows you to centre your merged file location between the two files. You can also centre on corners by first merging east-west files, then north-south.

4. REMEMBERING THE LAST FIVE FILES. All COMPASS programs now save the last five files you used in the file menu. This makes it easy to open recently used files.

There are also 11 other bug fixes and improvements.

CaveTools Version 3.0 Now Available - Geography Matters!

Bernie Szukalski, bszukalski@mindspring.com

CaveTools is an extension for ArcView GIS and includes conversion tools to easily translate COMPASS plot files to ESRI shapefile format. CaveTools also includes registration and transformation utilities so you can use cave survey data with other GIS data. New features in Version 3.0 include:

- New conversion option now supports direct conversion of COMPASS plot files to 3D shapefiles for visualisation and analysis using ArcView's 3D Analyst extension.
- Registration/transformation utilities now support Z (elevation) specification.
- Registration tools now support any shapefile format cave survey data, including survey data exported to shapefiles using Walls.

CaveTools Version 3.0 is an ArcView extension and requires ArcView GIS Version 3.1 or higher. CaveTools Version 2.0 supports ArcView GIS Version 3.0 or higher.

CaveTools is free, and you can download it from http://www.mindspring.com/~bszukalski/cavetools/cavetools.html

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Re: Instrument Lighting

Stuart France said, in the last issue:

I would try and send you some pictures, but things are very busy.

Well, he got round to it, and here they are:These two pics show the surface-mount LED on its wire (below), and how it works in practice (above)